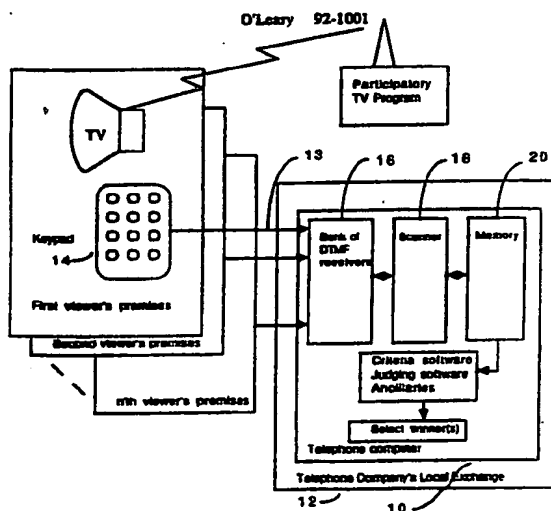




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(54) Title: A PARTICIPATORY TELEVISION SYSTEM**(57) Abstract**

A viewer participates in a television program using conventional dual-tone multifrequency (DTMF) telephone keypad (14). The viewer dials an access number which connects him to the telephone computer portion (10), then inputs his personal identification data, data specifying the participating activity and data required to participate in the activity. The tones generated by keypad (14) are received and decoded by a DTMF receiver (16). A bank of DTMF receivers is located at the telephone company's local exchange (12). The output of each DTMF receiver (16) corresponds to the inputs, in real time, sequentially scanned and stored in memory (20) with a time-tag (44) is then used as the input to a criterion program (48). The outputs of criterion program (48) are passed to the judging program (50) selecting the winners. The additional software (52) is used to select, announce, and notify (54) winners.

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A PARTICIPATORY TELEVISION SYSTEM

FIELD OF INVENTION

The present invention relates to participatory television systems, in which a viewer can interact with a TV program which he is watching. To participate in the TV program, the viewer uses the keypad of his dual tone multifrequency (DTMF) telephone. A key feature of the subject invention
5 includes a "telephone computer", which receives, interprets, and evaluates the inputs of many viewers, in real time. This telephone computer integrates the TV program, and the viewers' conventional DTMF telephones into a novel, low-cost form of participatory television.

From the viewer's standpoint, this invention enables him to
10 participate in a TV program which he watches on a conventional TV set. His participation only requires that he have a conventional dial-tone telephone. Using the telephone's keypad, he inputs his response to a contest, or other activity, which is presented on the TV program. The program content and activity are configured to provide opportunity for
15 meaningful viewer responses. The activity may be a contest, or the viewer may be required to verify that he has absorbed information presented on the TV; or there may be some other activity which requires the viewer's participation. The viewer's responses may be competitive with those of all other listeners, and he can win prizes based on both the speed and
20 accuracy of his answers.

The particular advantages of the invention are: (1) It operates in real time, so that meaningful contests involving speed of response can be conducted, (2) the viewer can participate in the activity using equipment already found in most homes. He need not purchase or otherwise obtain

any special equipment, and (3) the viewer's participation is all conducted via local phone calls, so there are no charges for pay calls (900 numbers) and no long distance charges.

5 The invention provides benefits to the persons participating in participatory TV programs, who can have an exciting and informative experience and can win prizes of value. The invention also provides significant monetary benefits for the television station or cable TV system broadcasting the TV program, and for the advertisers sponsoring such programs.

BACKGROUND OF THE INVENTION

A number of "interactive" television programs have been tried or proposed. Except for the present invention, these programs fall into two general categories:

1. The first general category involves use of the conventional
5 telephone network. The viewer dials either an 800 number, which is free to the consumer, or a 900 number, which is paid for by the consumer. In either case, the telephonic connection is made by the switched telephone network, which means that the time elapsed depends on which particular telephone is being used, the configuration of the telephone network, and the
10 telephone traffic existing on that network. The first person to call will not necessarily be the first person whose call is received or recorded. This means that it is not possible to have any sort of timed contest, or "race" involving the conventional use of the telephone system.

2. The second general category involves use of a special keyboard,
15 usually coupled to a computer, which is purchased, leased, or rented by the viewer, and which is located on the viewer's premises. This keyboard equipment transmits information to some central location. It transmits on a communication channel such as the phone lines, or cable TV lines, or radio frequencies. This approach does permit a race, and selection of a

winner. However, the system is inherently expensive, because there must be a special keyboard apparatus on each viewer's premises.

Each of these two general approaches has significant disadvantages:

5 1. The first approach, using the switched telephone network, is too slow and erratic to select the winner of a race. Furthermore, use of 900 numbers can be quite expensive. The cost of 900 numbers engenders resentment on the part of viewers, and their use is subject to widespread abuse; the charges are billed to a particular phone, so that charges may be incurred by anybody with access to the phone, e.g. children.

10 2. The second approach, using specialized keyboard equipments, is expensive to the viewer. Even if the cost of the equipment is subsidized, the price to the consumer will act as a significant deterrent to the purchase and use of this type of apparatus.

15 There is a long felt need in the participatory TV industry for a participatory television system which would enable a TV viewer to participate in various activities, such as a competitive "race" for prizes, using his existing telephone, while incurring little or no expense to the viewer.

SUMMARY OF THE INVENTION

The present invention involves a computer controlled, telephone based, system which operates in conjunction with one or more suitable television programs. The television program offers prizes to those viewers who can respond appropriately to contests. If the viewer decides
5 to participate, he dials the game show's access number, which causes his telephone to be connected to a "telephone computer" 10 located at the local telephone exchange 12.

There are 12 buttons on a standard dual tone keypad 14. In order to obtain a useful alphabet of 26 letters, 10 decimal numbers, and
10 ancillary characters like space, start, stop, and decimal point, it is necessary to provide 2 keystrokes for each character. Each such pair of keystrokes is interpreted as a character in an alphabet. Most of the alphabet shown in Figure 1 is presently being used as a keypad alphabet to obtain stock market quotes over the phone. The alphabet in Figure 1
15 will be used in the following discussion.

If the viewer decides to participate in a particular activity of the program 22, he would first dial the 4 digit access code connecting him to the telephone computer 24. The access number will probably have 4 characters, requiring 8 keystrokes.

20 The telephone computer assigns his telephone to a particular DTMF receiver 26, and the telephone computer assigns him a corresponding memory location 28. His next action, once connected to the participatory TV system, would be to input his ID code 30, which may be the number of the telephone being used, or some number
25 assigned to him by other arrangement.

Meanwhile the TV programs display the log-on number of one or more upcoming participatory activities. In order to participate in one of these, the viewer logs on by inputting: (1) a start command of 2 asterisks, (2) the two digit number corresponding to that particular activity, and (3)
30 the finish symbol of two pound signs 32.

When the activity begins, the viewer can input entries at any time during the activity 36, in accordance with keyboard requests made by the participatory program 38. His completed input is followed by the finish symbol of two "pound" signs 42. The finish symbol indicates that no
5 further input is to be accepted from this phone line except a start symbol. If, during the activity, he decides not to finish his participation, he will also input the finish symbol 42.

At this point in time, he can hang up, or he can log on via the start symbol of two asterisks. He can then select the number of a
10 subsequent activity 46 whose activity number appears on the TV 50.

The tones generated by viewers' telephone keypads enter the telephone computer via a parallel bank of DTMF (dual tone multifrequency) receivers located at the local telephone exchange. This bank of DTMF receivers is a key feature of the present invention. Each
15 DTMF receiver is assigned to one telephone and records all of that telephone's keyboard inputs in real time. Using the specifications for a standard DTMF receiver circuit, the GEC Plessey MV 8870-1, the pair of tones must be present for a minimum of 5 millisec, and a maximum of 14 msec, in order to be accepted by the DTMF receiver 16. Because
20 human reaction time is considerably longer than this - e.g. typically 80-100 millisec, it would be feasible to time share one DTMF receiver 16 among several telephone lines.

The scanning subsection of the telephone computer 18 scans the DTMF receiver bank 16, and reads each output character into a memory
25 string as fast as it is generated 40. The scanner speed is only limited by the write time of the associated memory. If a conservative scan rate of 1,000,000 scans per sec is used, there will be at least 5000 scans during the 5 millisec when an individual DTMF may be producing a valid output.

30 The telephone computer may be of modular design, incorporating about 500 to 5000 DTMF receivers per module. There may be more than

one standard module size. Thus, if a bank of 5000 DTMF receivers is serviced by one scanner, there will always be at least one scan of each DTMF receiver 16 in the bank in every 5 millisecond interval. Because of the possibility of multiple scans per readout interval, it is necessary to provide logic to assure that each valid output is only read out only once per valid DTMF receiver 16 output. Thus at any moment, the status of each memory string is an accurate reflection of all prior keypad inputs by each viewer who has logged on.

When any viewer terminates his input, by inputting the "finish" symbol the telephone computer accurately time tags the memory with the time at which the call was completed 44. This is a key difference from other systems, since the time-tag is an accurate real time reading. This accuracy allows contests in which speed of response determines the winner.

The local exchange provides a termination point for each phone line from a customer's premises. I.e. each phone line provides a continuous DC path from the customer's telephone to the local exchange. The viewer will not access the switched portion of the telephone at any time during his participation in the TV program.

About 30,000 telephone lines terminate at a typical local exchange in an urban area. The actual number of lines may vary from about 500, in a rural area, to as many as 50,000 in some urban areas. The basic telephone computer would be modular in design; for example, a module could provide for 500 lines or less. If a local exchange had 30,000 lines, and a 10% response were anticipated, a 3000 line telephone computer would be provided.

Key features of the telephone computer are:

(1) Each incoming telephone line from a viewer is connected simultaneously to a DTMF receiver at the local telephone exchange. The DTMF receiver may be dedicated to one phone line, or it may be time-shared among several phone lines. The output of each DTMF receiver is

scanned rapidly during the entire hour of commercials, and for a period of time after the conclusion of the hour. Each output is stored in an assigned memory location in a digital memory. Thus the activity associated with each telephone connected to the telephone computer is
5 continually monitored and recorded in the direct access memory of the telephone computer.

(2) Each person who wishes to participate in the participatory TV program will dial a prefatory number, typically 4 decimal digits, which is reserved for this show. This prefatory number will connect the line to
10 one of the DTMF receivers. The participant can leave the line connected for the duration of the show without incurring any charges, and without causing any blockage or slowdown elsewhere in the phone system. The only telephone line which is affected during this interval is the TV viewer's own telephone line. The operation of this system will not affect
15 the switched portion of the telephone network.

(3) Once the telephone is connected to its assigned DTMF receiver, each dial tone generated on the telephone's key pad causes a corresponding digital output at the DTMF receiver. A logic output 72 associated with each DTMF receiver is "true" whenever the output of the
20 DTMF receiver is valid, and the prior digital output from the receiver has been read out. Whenever the logic output is true, the four binary outputs 64 of the DTMF receiver are read out and stored in a dedicated memory address. The logic 60 is only true for one scan period during the time when the DTMF receiver's output is valid, as indicated by the
25 tri-state output enable (TOE) 66. The logic 60 assures that each key pressed at the telephone keypad results in one, and only one, character being stored in the memory associated with that particular telephone.

The logic 60 forms a logical and 70 of the scanner signal, the present TOE 66 and the negative of the TOE delayed by one scan time.
30 The negative delayed value of TOE 66 may be easily formed by a delay (D) flip flop 68.

(4) The largest possible error, or uncertainty, with regard to who won a particular "race", is the time of one full scan cycle. The subject invention reduces this maximum error to a negligible value by using a fast scan, e.g. 1 million scans/sec.

5 (5) Criteria software 48 sorts the entries by such criteria as correctness and speed of each viewer's entries.

(6) Judging software 50 determines the winner. The judging software may consider, in addition to the aforementioned criteria, whether the particular line or viewer has already won or more prizes
10 within a certain time interval, and whether the response from a particular telephone line is too fast, indicating that the viewer is using artificial aids to rapid response, such as a personal computer.

(7) Ancillary software 52 performs such tasks as final selection, recording, and notification 54 of winners.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a listing of an alphabet used to provide all the alphanumeric characters plus other characters necessary for this invention.

5 Figure 2 is a block diagram of the elements of the participatory television system, comprising a broadcast participatory TV program; a TV receiver, and a telephone with DTMF keypad on the viewer's premises; and a telephone computer located at the telephone company's local exchange.

10 Figure 3 is detailed flow chart of the participatory TV, showing which elements are within the TV program, which elements are on the viewer's premises and subject to his control, and which elements are involved in the telephone computer.

Figure 4 is a detail of the DTMF (dual-tone multifrequency) receiver logic used in the present invention.

15 Figure 5 is a block diagram of the scan logic used to transfer valid data from the DTMF receivers to a memory bank.

Figure 6 defines the dual tones generated by depressing each of the 12 buttons on a conventional DTMF telephone keypad.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

This preferred embodiment will be described in conjunction with a television program which consists of an uninterrupted hour of specialized commercials, each commercial lasting approximately 30 seconds. Many of the commercials shown during this hour will differ from conventional commercials in that they will offer prizes or discounts of value to those members of the audience who watch the material being presented.

The television viewer is motivated to watch the show in order to obtain something of value, e.g. prizes or discounts, with no direct cost to him. The television station and the advertisers are interested in having a large number of viewers actually pay attention to the commercials being presented.

There are 3 parties to the transactions which occur in a participative television system: (1) the viewers, (2) the broadcasters, and (3) the advertisers. The subject invention satisfies all three parties.

The viewer can win prizes of value at no direct cost, using an ordinary dual tone telephone keypad. The broadcaster can achieve high revenues because the program will have a large and attentive audience. The advertiser benefits because a large audience watches his commercials, and watches them carefully.

In order to provide a "level playing field" the rules of any game involving speed of response (a race) would specify that the keypad entries be made manually, and not with the aid of a personal computer, or other aid.

In the present invention, a bank of DTMF (dual tone multifrequency) receivers is provided at a local exchange 12 of the telephone company. Each telephone in a given area terminates at a local exchange 12. About 30,000 telephone lines terminate at a typical local exchange in an urban area. The actual number of lines may vary from about 500, in a rural area, to 50,000 in some urban areas.

The local exchange 12 provides a termination point for each phone line from a customer's premises. I.e. each phone line provides a continuous DC path from the customer's telephone to the local exchange.

5 That portion of the present invention which is referred to as the "telephone computer" 10 provides a large number of DTMF receivers 16 at the local exchange. During a participatory TV program, the telephone computer can be connected simultaneously to as many phone lines 13 as there are DTMF receivers 16, without adversely affecting any
10 other telephones in the telephone system. The output of each DTMF receiver 16 is scanned rapidly during the period when participatory entries are permitted. In the example described, this time period may be during the entire hour of commercials, and for an additional period of time after the conclusion of the hour. Thus the activity associated with
15 each telephone connected to the telephone computer 10 is continually monitored. All monitored activity is stored in the direct access memory 20 of the telephone computer 10.

Each person who wishes to participate in the TV show being shown will dial a prefatory number, typically 4 decimal digits, which is
20 assigned by the telephone company, and reserved for this participatory TV program. This prefatory number will connect the line to one of the DTMF receivers 16. The participant can leave the line connected for the duration of the show without incurring any charges, and without causing any blockage or slowdown elsewhere in the phone system. The
25 only telephone line which is affected during this interval is the TV viewer's own telephone line.

Once the telephone is connected to the its DTMF receiver 16, each dial tone generated on the telephone's key pad 14 causes a corresponding digital output at the DTMF receiver 16. A logic output 72 associated with
30 each DTMF receiver 16 is "true" whenever the output of the DTMF receiver 16 is valid, and the prior digital output from the receiver 16 has been read out.

When the logic output 72 is true, the output of the DTMF receiver 16 is read out and stored in a dedicated memory address 20. Immediately the output of the logic circuit 60 is reset to "false". Thus, each key pressed at the telephone keypad 14 results in one, and only one,
5 character being stored in the memory associated with that particular telephone 14. While the logic is shown as made up of discrete components in Figure 4, it is clear that the logic block could be incorporated in an integrated circuit.

As shown in Figure 6, there are 12 keys on a standard dual tone
10 keypad 14. In order to obtain a useful alphabet including the 26 letters, 10 decimal numbers, and such ancillary characters as space, start, stop, and decimal point, it is necessary to provide 2 keystrokes for each character. Each such pair of keystrokes may be considered a character in an alphabet; a suggested alphabet is shown in Figure 1. Most of the
15 code shown in Figure 1 is already used as a keypad alphabet to obtain stock market quotes over the phone.

When the viewer decides to participate in the program, he would place his telephone on line by dialing the 4 digit access number assigned to the particular activity 24. This connects his telephone directly to one
20 of the DTMF's of the telephone computer 26.

As soon as he is connected to the telephone computer 10, he will input the ID information necessary to identify him or the particular phone 30, which may be the number of the telephone being used, or some number assigned to him by prearrangement. At this point, he is
25 logged on to the telephone computer, which assigns a memory location 28, to the particular ID number - i.e. one memory location per connected phone.

The viewer might then decide to participate in a particular game, contest, or other activity being presented on the TV. Each separate
30 activity would be assigned an "activity number" which would appear on the TV. To indicate his desire to participate, the viewer would input the start command of 2 asterisks (**) followed by the appropriate "activity number" 32.

He will make appropriate keypad entries during, and possibly after, the activity 36. When he completes his activity, he will enter the finish symbol of two "pound" signs (##) 42. If he decides to cut short his participation in a particular activity, he would also enter the finish
5 symbol 42. He can then log on to a subsequent activity that he wants to participate in by inputting the start command (**) and activity number.

The telephone computer decides that an individual player has completed playing one game by detecting the finish symbol (##). As soon as the finish symbol is entered 42, the computer attaches a time tag
10 showing the actual time when the game was completed 44. This time tag is one of the key items in determining winners of "race" activities.

The largest possible error, or uncertainty, with regard to who won a particular race, is the time of one full scan cycle. The maximum error is the time of one scan cycle, and can be reduced to a negligible value by
15 using a fast scan 40.

The subject invention further provides:

1. Logic 60 associated with each DTMF receiver 16 which indicates when the DTMF receiver output is valid. This logic 60 uses the three state output enable (TOE) signal from the receiver 16, and the scanner
20 read out to determine whether the DTMF output should be read out.

2. A memory block 20 to provide adequate storage for all the responses which might occur from a particular telephone during a participatory TV session. A typical participatory TV session might last about one hour.

25 3. Scanning apparatus 40 which causes the telephone computer to sequentially scan the outputs of each DTMF's logic circuit, read out valid outputs, reset DTMF receiver logic, and read the resulting characters into memory.

30 4. A real time clock 43 which provides accurate real time readouts to the telephone computer when required. For instance, receipt of the finish symbol (##) 42 on a telephone line calls for delivery of a time tag 44 to that telephone line's associated memory area. It may also be

necessary to time each key entry if they appear at a higher rate than would be expected from manual entry.

4. Criteria software 48 which sorts the entries in memory by such criteria as correctness and time, and whether the keypad response from
5 a particular telephone line is too fast, implying that the viewer is using artificial aids to rapid response, such as a personal computer.

5. Judging software 50 which determines the winner. The judging software 50 may consider, in addition to the aforementioned criteria, whether the particular line or viewer has already won one or more prizes
10 within a certain time interval.

*DETAILED DESCRIPTION OF AN ALTERNATIVE
PREFERRED EMBODIMENT*

This television program of this alternative preferred embodiment presents an action sequence which has a number of "branch points", which are situations where the action can take one or more branches. For a simple example, the hero reaches a fork in the road and can turn either
5 left or right.

Prior to occurrence of each branch point, the program is interrupted, and each viewer inputs his estimate as to which branch will be chosen. The interruption time may be used for commercials, or other programming. After an adequate interval, the action will resume and it
10 will continue till the next branch point.

The winner might be the person who input the largest number of branches correctly. In case of multiple winners, rapidity of response, or other criteria would be considered.

The telephone computer 10 previously described would enable this
15 participatory TV program to function. The telephone computer 10 would only accept inputs for this particular program during the program's interrupt interval. The telephone computer would be able to select winners in real time, a capability which is unique to the subject invention.

*DETAILED DESCRIPTION OF A SECOND
ALTERNATIVE PREFERRED EMBODIMENT*

This television program of this second alternative preferred embodiment presents a selected portion of a movie. The goal is to correctly identify the movie based on a clip from the movie in question. This program would include the participation of studio contestants in a
5 conventional game show format, with the selected portion of a movie being shown to both the studio contestants and the at-home audience. Proper

identification is aided by the appearance of a portion of the correct answer on an alphanumeric display.

The movie is stopped whenever one of the in-studio contestants guesses the movie name. If the guess is incorrect, the movie continues.

- 5 However, at-home viewers can also participate, although their input will not stop the movie. There would be a higher level of prizes awarded to the in studio contestants. At-home participants who perform well will have the opportunity to move up to becoming in-studio contestants.

- 10 A variation of the concept would ask for other, or additional information. For example, the contest might require furnishing the name of one or more of the actors or furnishing both the name of the movie and the name of one or more actors.

- 15 This program concept, combined with the telephone computer 10 makes it possible for a viewer at home to compete with a contestant panel in the studio, in real time. This real time participatory capability is unique to the subject invention.

CLAIMS

What is claimed is:

1. A telephone computer system (10) which enables a television viewer to participate in a television program by entering inputs into a keypad (14) of a conventional touch-tone telephone, said telephone computer system (10) comprising:

5 dual tone multifrequency (DTMF) receiver means (16), each of which is connected to one or more telephone lines, and each of which converts a received DTMF signal into a digital character output;

 logic means (60) associated with said DTMF receiver means to indicate when one of said DTMF receiver's output characters has stabilized;

10 scanner means (18) which read out said digital output character when said logic means (60) indicates that said receiver's (16) output has stabilized, said scanner means (18) scanning all of said DTMF receiver (16) outputs in sequence;

 memory means (20) to store a string of characters from each of said
15 DTMF receiver means (16), said memory means (16) being accessed in sequence by said scanner means (18);

 real time clock means (43), providing a time tag (44) to each of said memory strings, recording a time when said string is closed by receipt of a
20 finish character (42) from said input device (44), or at such other time as may be desirable;

 software criteria means (48) which sort all of said memory strings according to criteria contained in said software criteria means (48);

 software judging means (50) to select one or more winners, said winner being selected according to judging rules contained in said judging means (50);
25 and

software means (52, 54) to associate each memory string with an individual television viewer.

2. A system as in Claim 1, in which said participatory television program is comprised substantively of commercials, one or more of said commercials offering reduced prices on merchandise or services to those viewers who indicate, via said keypad (14), that they have been attentive to
5 one or more of said commercials;

3. A system as in Claim 2, in which one or more of said commercials offers prizes to that particular viewer who inputs a complete, accurate, and timely response, as requested by said program, via said keypad (14);

4. A system as in Claim 1, in which said participatory television program has a number of time intervals when all TV action stops prior to a branch point, allowing time for a viewer to estimate which branch will be taken, said estimate being transmitted to said telephone computer system.

5. A system as in Claim 1, in which each contest offered by said participatory television program involves display of a scene from a movie, with an objective of correctly and quickly identifying said movie, and in which use of said telephone computer allows a viewer to compete with in-
5 studio contestants in real time.

6. A system as in Claim 3, in which said DTMF receiver means (16), said logic means (60), said scanner means (18), said real time clock means (43), and said memory means (20) are located at a local exchange of a telephone company (12), so that said telephone keypads (14) are continually
5 connected to said DTMF receiver means (16) during said television program.

7. A system as in Claim 4, in which said DTMF receiver means (16), said logic means (60), said scanner means (18), said real time clock means (43), and said memory means (20) are located at a local exchange of a telephone company (12), so that said telephone keypads (14) are continually
5 connected to said DTMF receiver means (16) during said television program.

8. A system as in Claim 5, in which said DTMF receiver means (16), said logic means (60), said scanner means (18), said real time clock means (43), and said memory means (20) are located at a local exchange of a telephone company (12), so that said telephone keypads (14) are continually
5 connected to said DTMF receiver means (16) during a television program.

9. A system as in Claim 6, in which said receiver means (16) and said logic means (60) are provided by an integrated circuit.

10. A system as in Claim 7, in which said receiver means (16) and said logic means (60) are provided by an integrated circuit.9.

11. A system as in Claim 8, in which said receiver means (16) and said logic means (60) are provided by an integrated circuit.

12. A system as in Claim 9, in which each of said DTMF receiver means (16) is time shared among a plurality of incoming telephone lines (13).

13. A system as in Claim 10, in which each of said DTMF receiver means (16) is time shared among a plurality of incoming telephone lines (13).

14. A system as in Claim 11, in which each of said DTMF receiver means (16) is time shared among a plurality of incoming telephone lines (13).

O'Leary 92-1001

CODE FOR USING TELEPHONE KEYPAD AS INPUT DEVICE
 (Each character requires two key strokes)

<u>Character</u>	<u>Two key Code</u>	<u>Notes</u>
Start	**	Start of Message
Finish	##	End of Message
. (period or decimal point)	*#	
space	#*	Space between words
0 (zero)	00	
1	10	
2	20	
3	30	
.....	
9	90	
A	21	No distinction between Caps and lower-case.
B	22	
C	23	
d	31	
e	32	
f	33	
g	41	
h	42	
i	43	
j	51	
k	52	
l	53	
m	61	
n	62	
o	63	
p	71	
q	7*	q does not appear on keypad
r	72	
s	73	
t	81	
u	82	
v	83	
w	91	
x	92	
y	93	
z	9*	z does not appear on keypad

Fig. 1

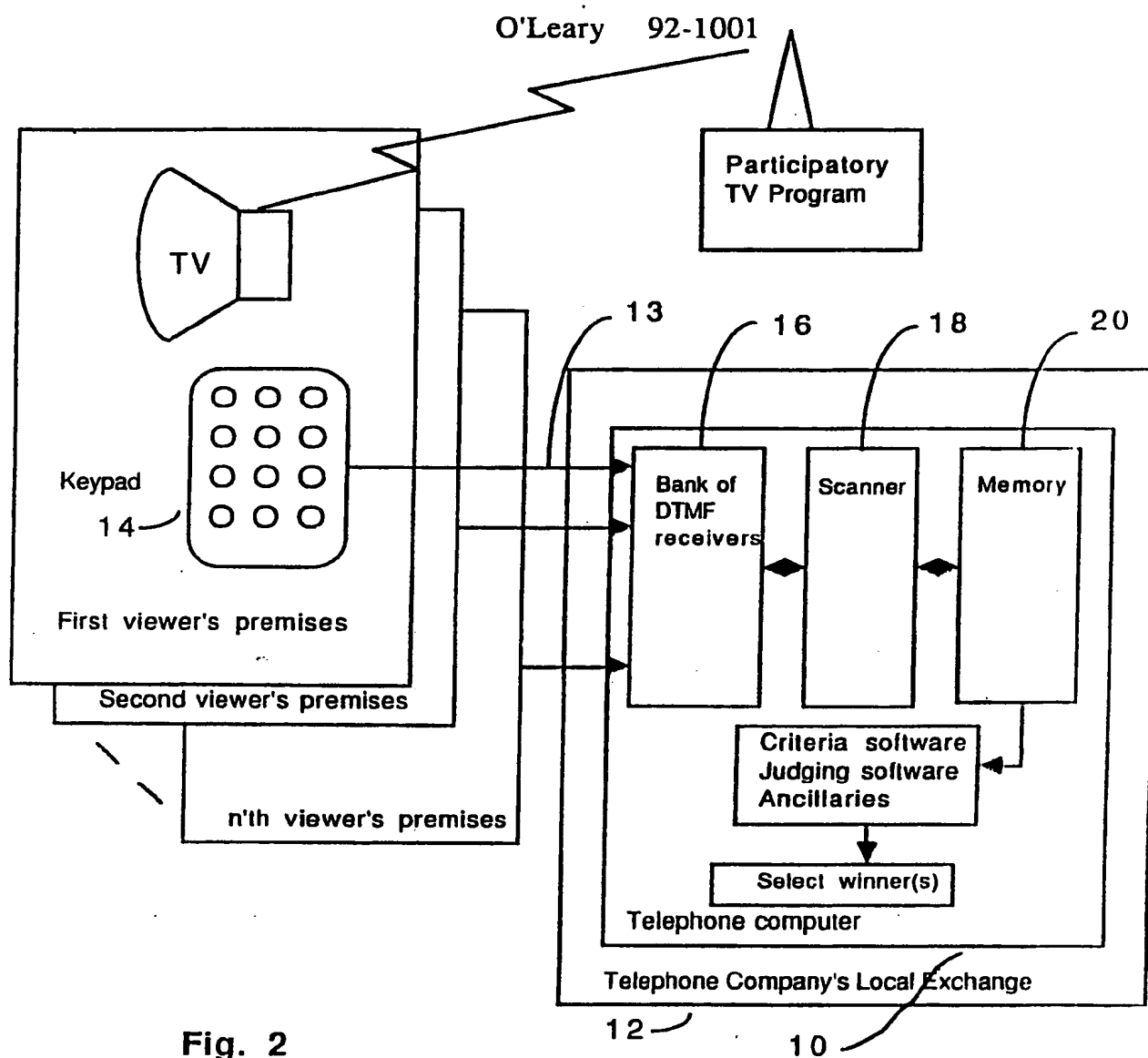


Fig. 2

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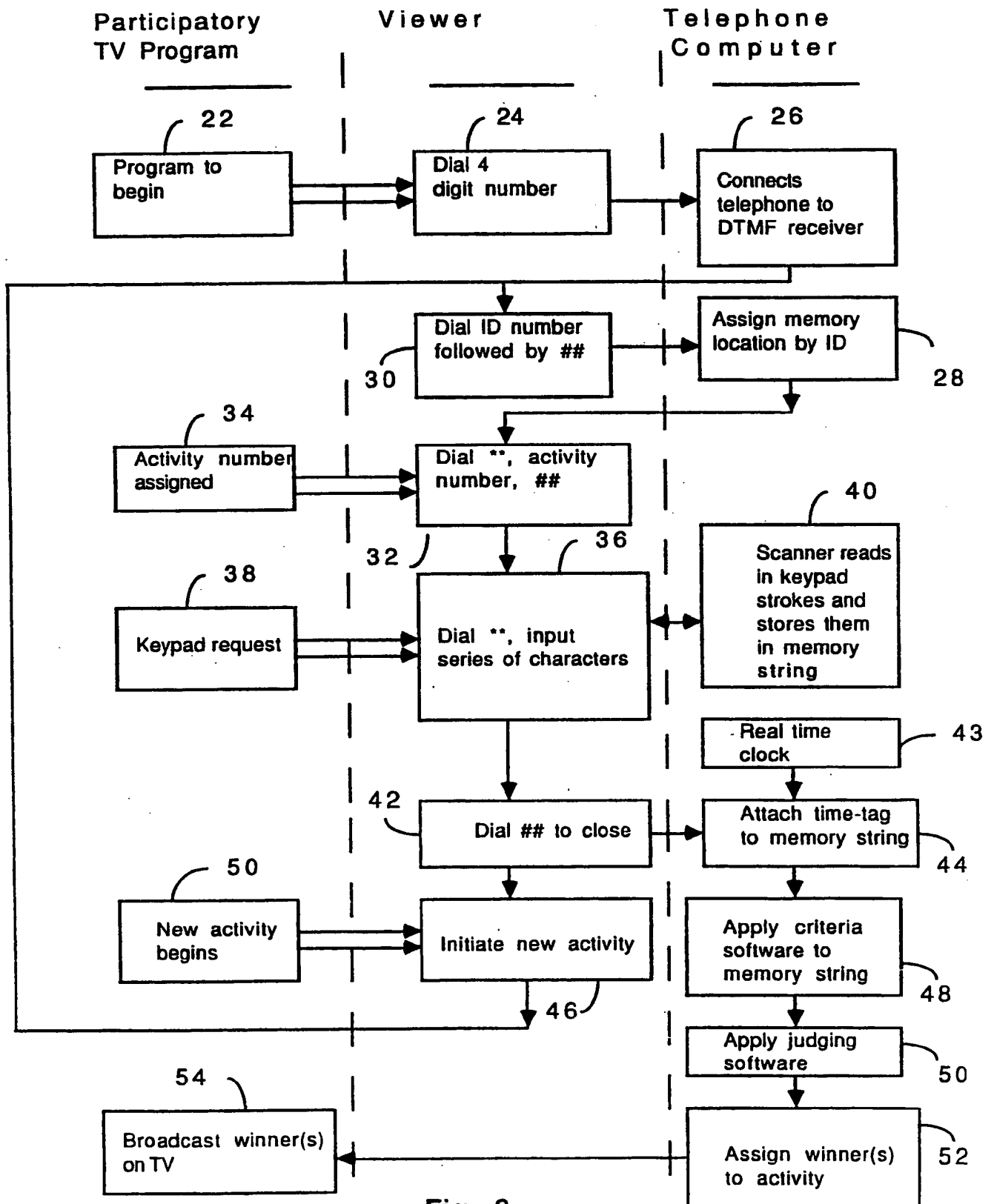
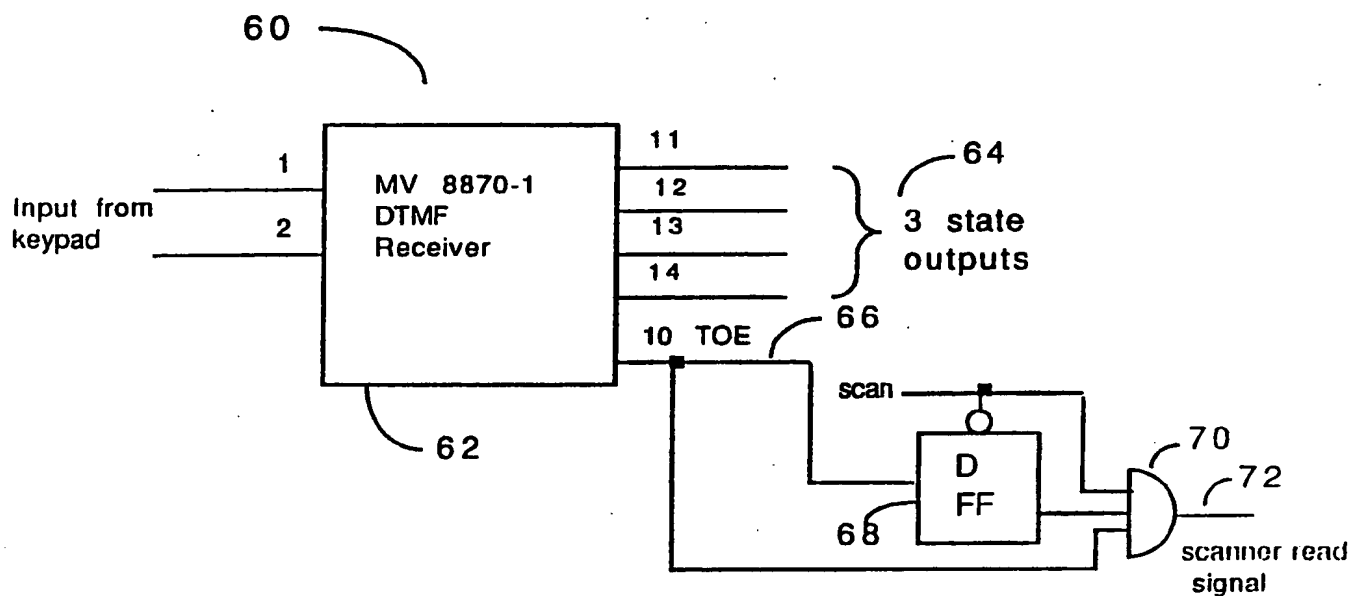


Fig. 3

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**Fig. 4** DTMF Receiver Logic

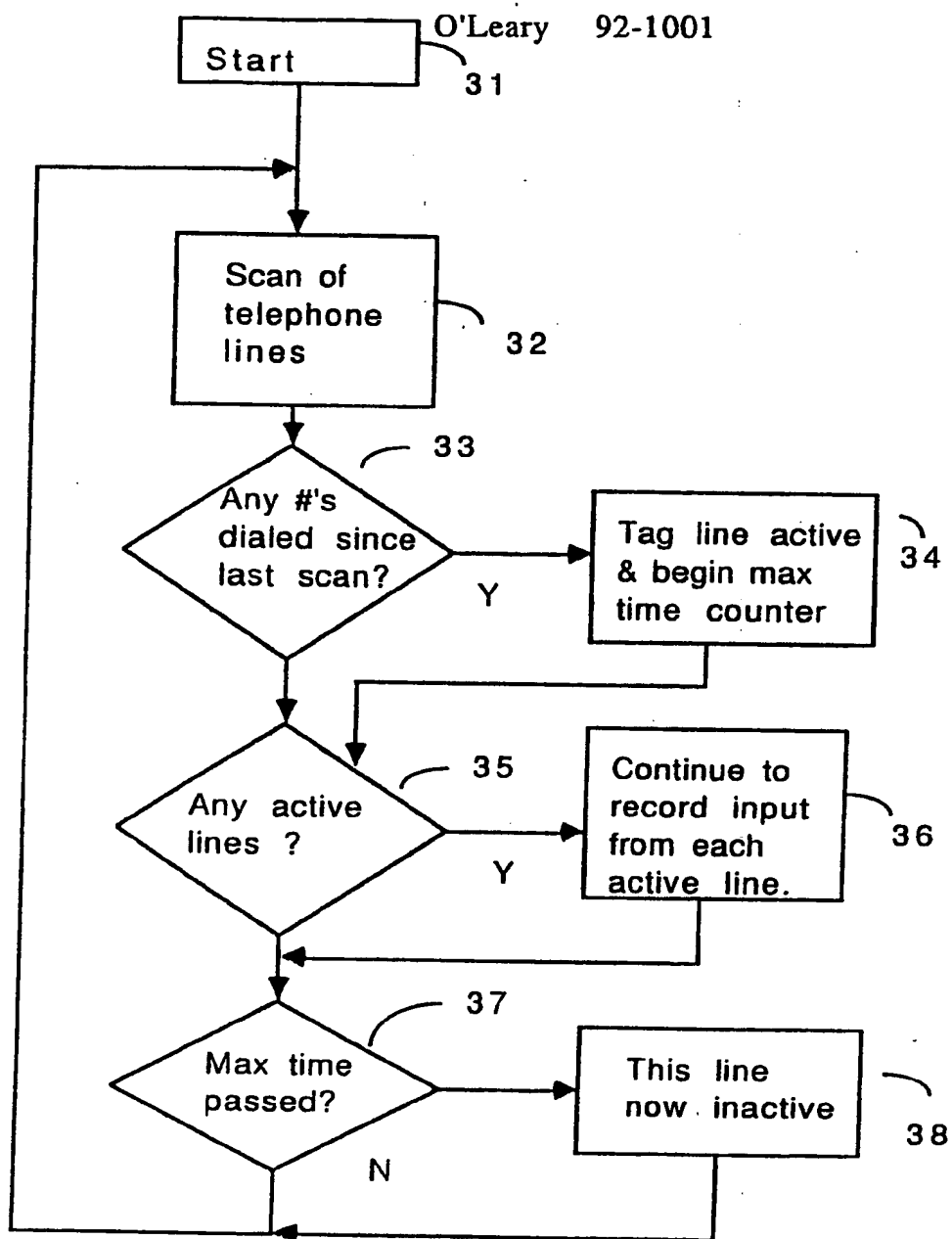
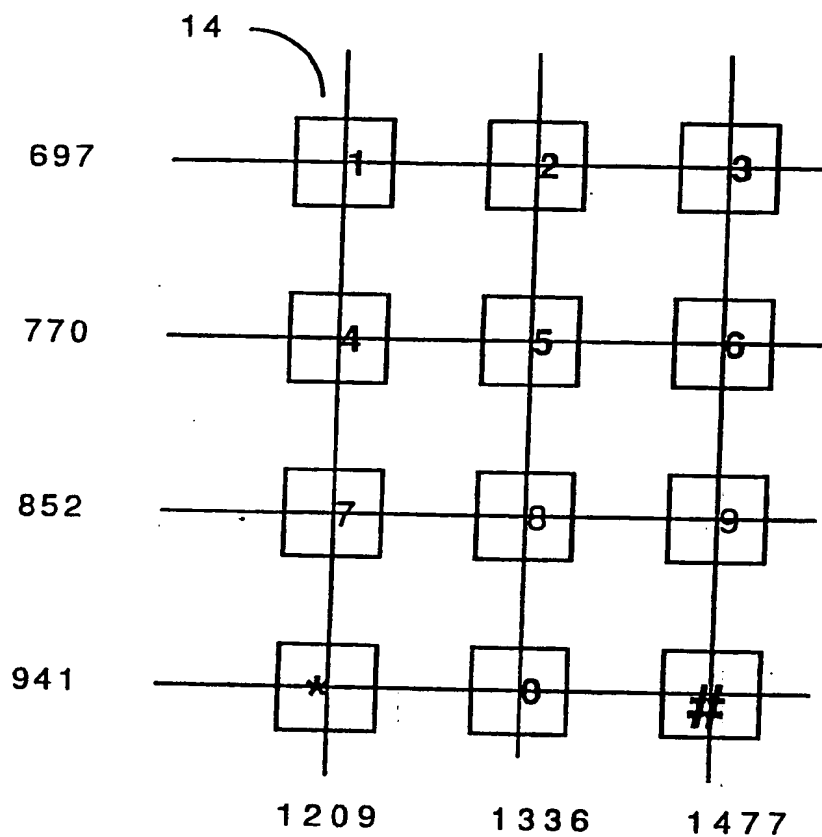


Fig. 5

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Dual Tone MultiFrequency (DTMF) Tones
Generated by Telephone Keypad



Frequencies (Hz)

FIG 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/93/07691

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :H04N 7/14

US CL :358/85

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 358/84, 85, 86; 379/93,97; 273/439

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,592,546 (Fascenda et al) 03 June 1986. See figures 1-2	1-5, 6, 7
A	US,A,4,722,526 (Tovar et al.) 02 February 1988. See figures 1a-5.	1, 6-8
A	US,A,5,018,736 (Pearson et al) 28 May 1991. See figure 2	1
A	US,A,5,083,800 (Lockton) 28 January 1992. See figure 1-4	1-5, 6-8
A,P	US, A, 5,218,631 (Katz) 08 June 1993. See figures 1-4	1-5, 6-8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be part of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 10 October 1993	Date of mailing of the international search report 17 NOV 1993
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. NOT APPLICABLE	Authorized officer DANIEL WU Telephone No. (703) 305-6735